

(No Model.)

4 Sheets—Sheet 1.

E. LANGEN.
ELEVATED RAILWAY.

No. 550,513.

Patented Nov. 26, 1895.

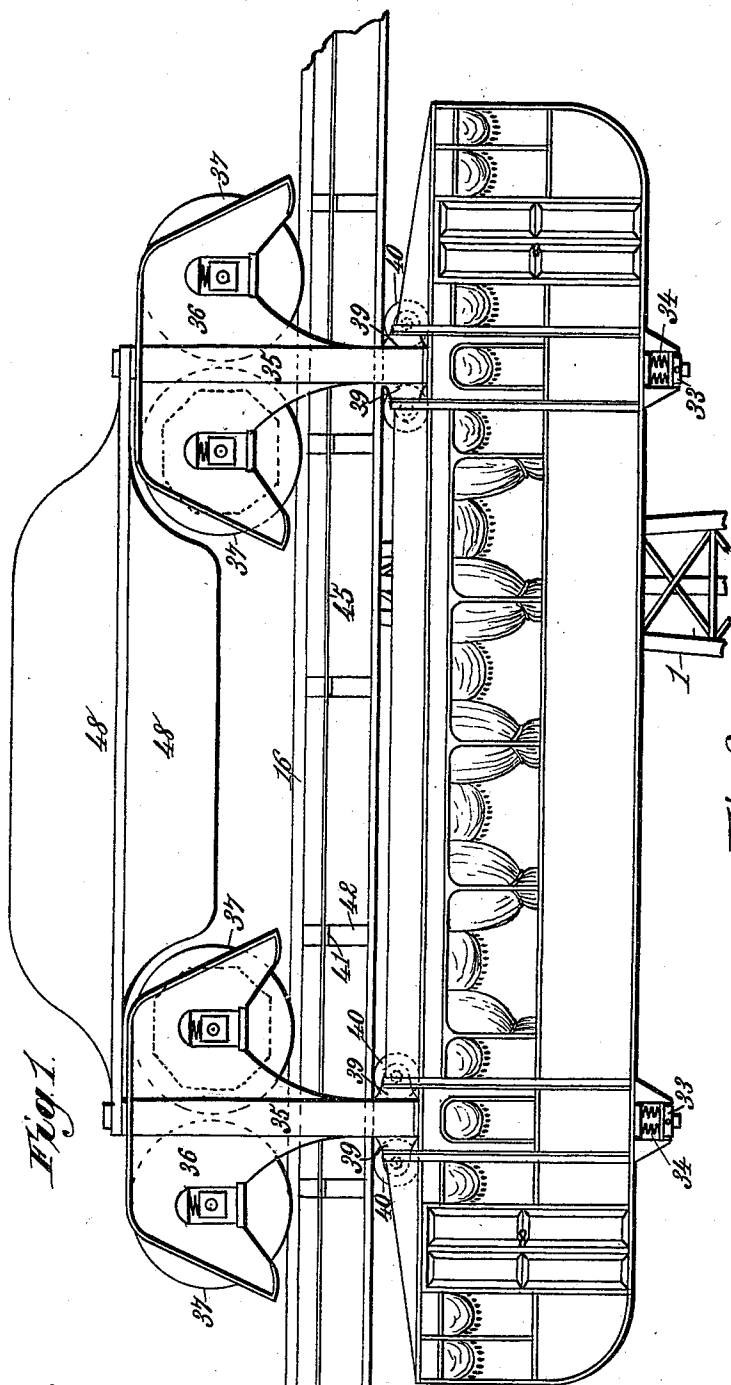
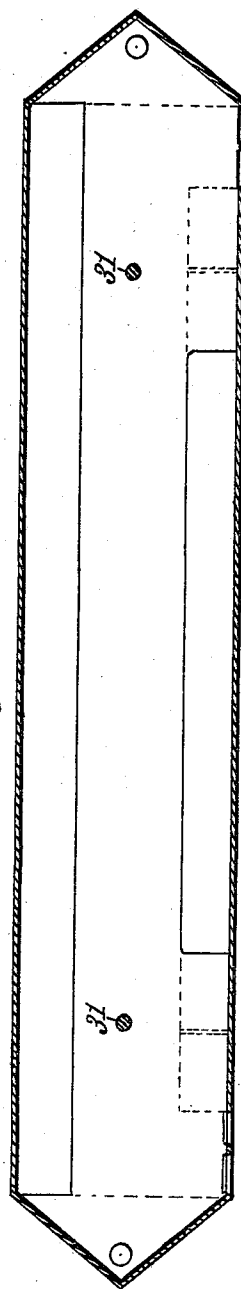


Fig. 2.



Witnesses.
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Dennis Sumby.

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Eugen Langen.
By *James L. Norris*
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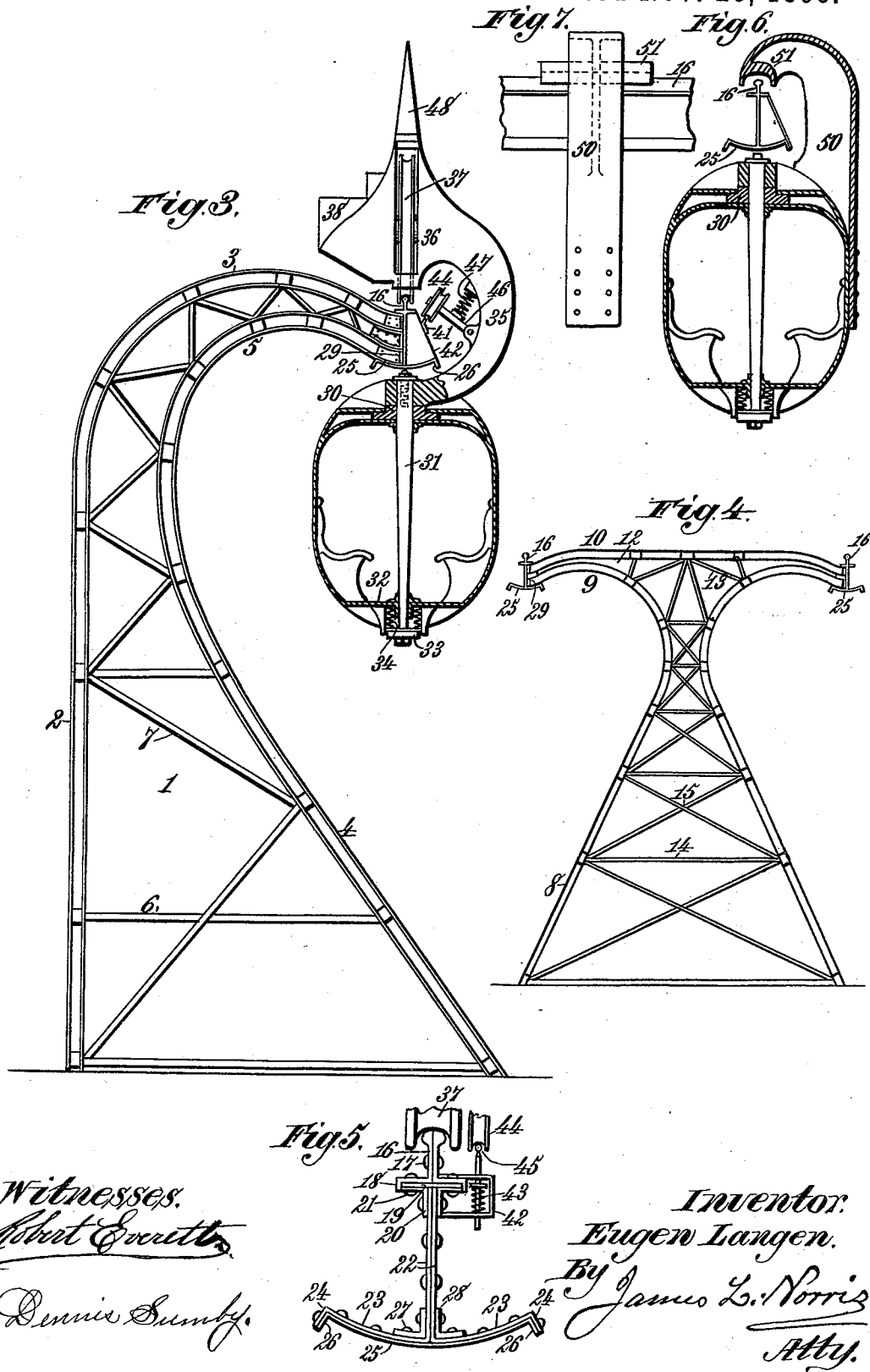
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4 Sheets—Sheet 2.

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(No Model.)

4 Sheets—Sheet 3.

E. LANGEN.
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Fig. 3.a

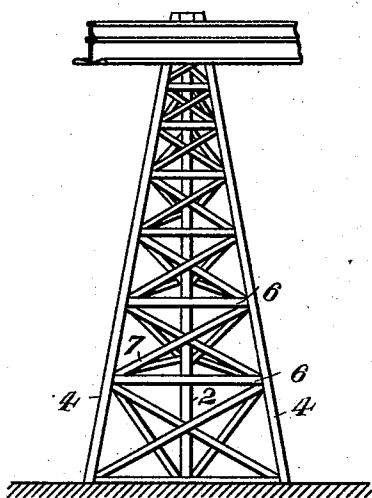
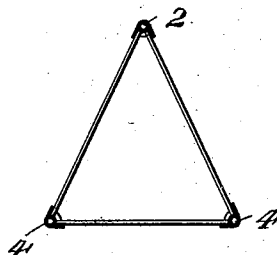


Fig. 3.b



Witnesses

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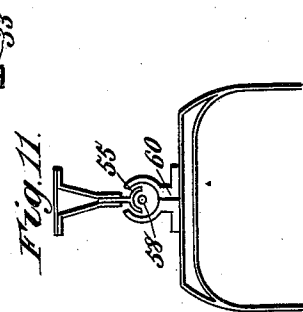
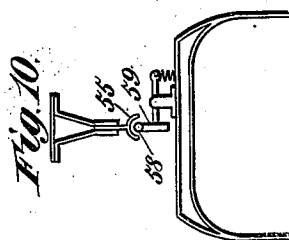
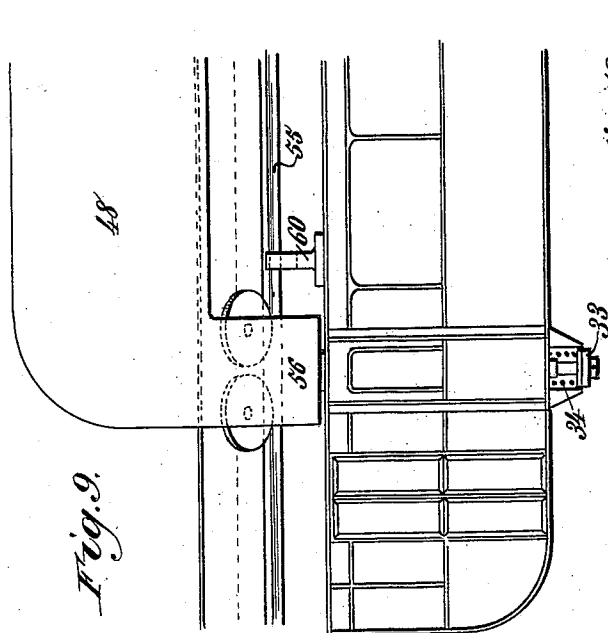
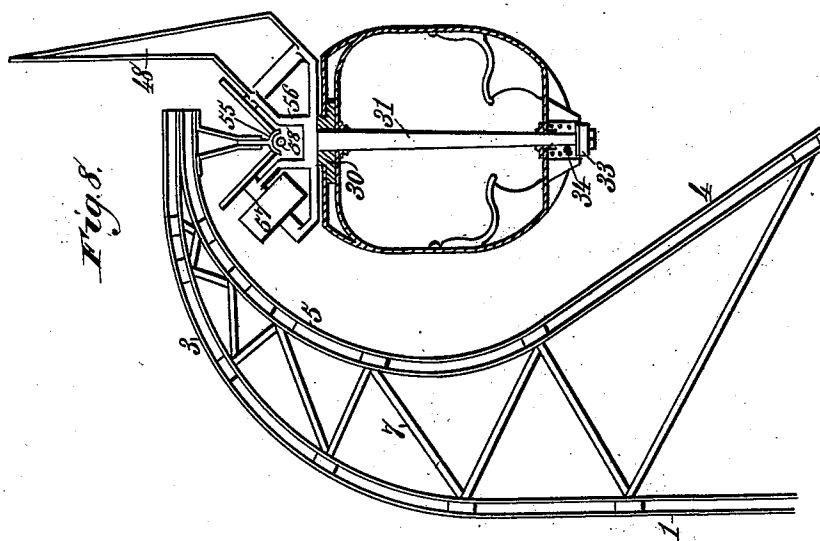
(No Model.)

4 Sheets—Sheet 4.

E. LANGEN.
ELEVATED RAILWAY.

No. 550,513.

Patented Nov. 26, 1895.



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UNITED STATES PATENT OFFICE.

EUGEN LANGEN, OF COLOGNE, GERMANY.

ELEVATED RAILWAY.

SPECIFICATION forming part of Letters Patent No. 550,513, dated November 26, 1895.

Application filed June 28, 1894. Serial No. 516,012. (No model.) Patented in England February 25, 1893, No. 4,189; in Belgium February 25, 1893, No. 103,612; in France February 25, 1893, No. 228,224; in Turkey March 4, 1893, No. 349; in Italy March 11, 1893, LXVI, 46; in Switzerland July 5, 1893, No. 6,598; in Sweden October 14, 1893, and August 16, 1894, No. 5,391, and in Austria-Hungary April 26, 1894, No. 47,324 and No. 79,276.

To all whom it may concern:

Be it known that I, EUGEN LANGEN, a subject of the Emperor of Germany, residing at Cologne, Germany, have invented new and useful Improvements in Elevated-Railway Cars and Motors, (for which Letters Patent have been obtained in Great Britain, dated February 25, 1893, No. 4,189; in Austria-Hungary, dated April 26, 1894, No. 47,324/79,276; in Belgium, dated February 25, 1893, No. 103,612; in France, dated February 25, 1893, No. 228,224; in Italy, dated March 11, 1893, LXVI, 46; in Sweden, dated October 14, 1893, and August 16, 1894, No. 5,391; in Switzerland, dated July 5, 1893, No. 6,598, and in Turkey, dated March 4, 1893, No. 349,) of which the following is a specification.

My invention relates to the construction of elevated railways of the type in which the cars are suspended from an overhead rail.

It is the purpose of my invention to provide a railway of this type suitable for the transportation of passengers at high speeds in which the dangers and objections hitherto prevalent shall be overcome or avoided. In other words, it is my object to provide an elevated or overhead railroad having such construction that the occupation of large areas of ground and the ponderous and bulky structures heretofore regarded as necessary may be done away with; the cars or trains may be propelled thereon at higher speeds than have heretofore been attainable with safety; the curves, switches, and crossings may be projected and located as circumstances require, and whereby provision is made for traversing curves of various radii without excessive reduction of speed and without exposure to danger or to the excessive friction and disagreeable motion produced by the use of lateral guards which prevent the car from assuming the positions due to centrifugal force.

It is one purpose of my invention, also, to make provision for the retention of the car upon a single line of rail under all conditions; to permit the free lateral swing or vibration of the car in rounding curves; to provide means for preserving the normal position and equilibrium of the same in case of high winds

or gales acting laterally; to secure smooth, comfortable, and comparatively noiseless locomotion; to combine with the suspended car simple means whereby its leaping from the rail or leaving the same shall be prevented in every position of the car.

The invention consists to these ends in novel features of construction and in the parts and new combinations of parts hereinafter fully described, and then particularly pointed out in the claims which follow this specification.

To enable others skilled in the art to fully understand and to make and use my invention, I will proceed to describe the same in detail, reference being had for this purpose to the accompanying drawings, in which—

Figure 1 is a side elevation of a portion of an elevated or overhead railroad constructed in accordance with my invention, a single car being shown suspended therefrom. Fig. 2 is a sectional plan view of the car-body, the rails and wheels being omitted. Fig. 3 is a vertical transverse section of the parts shown in Fig. 1. Fig. 3^a shows a back view of the supporting-frame. Fig. 3^b is a cross-section of the supporting-frame. Fig. 4 is a detail view showing a modification of the supporting structure to provide for a double track. Fig. 5 is a detail view upon an enlarged scale, showing a portion of the track-supporting structure. Figs. 6 and 7 are a cross-section and elevation, respectively, of a portion of the car, showing an extra safety device or anchor to sustain the car in case the connection between the car and the wheels should give way. Figs. 8 and 9 show a cross-section and elevation, respectively, of a modified form of this invention. Figs. 10 and 11 are detail views showing the arrangement of the trolley and live conductor and the safety-anchors, respectively.

The reference-numeral 1 in said drawings indicates the supporting structure for the car-rail. This structure may be either single or duplex, according to the requirements of travel, which may call for either a single or a double track. The single track is supported at suitable intervals by a framework com-

posed of three principal parts which closely resemble each other in general form. One of these parts (indicated in Fig. 3 by the numeral 2) consists of a straight upright slender column, preferably tubular, the upper portion 3 of which is curved, with a radius of about one-half the length of the straight portion, more or less, through an arc of a little more than ninety degrees, so that its extremity is slightly lower than the highest point of the curve. The two remaining parts are duplicates, each consisting of a straight body portion 4 and an upper part 5, which is curved through an arc greater than that of the part 3 and of less radius. The part 2 is set in the earth or any other suitable support, and is upright, while each of the parts 4 is inclined thereto at a considerable angle and so arranged relatively to each other and to the part 2 that their lower ends are at the angles at the base of an isosceles triangle and the part 2 at the apex. The straight body portions 4 converge slightly from the ground upward and their curved portions 5 lie nearly but not quite in parallelism with the curved part 3, the extremities of the former lying just below and a little upon one side of the extremity of the curved part 3. The three members are bound together by horizontal braces 6 and truss-braces 7, forming a structure having great strength, but occupying a comparatively small space.

The double structure is composed of four principal members, duplicates one of another, and each having a straight body portion 8 and a curved upper part 9. Two of these members are arranged upon each side, their straight body portions inclined inward from the base upward and their curved upper portions turned outward. The lower ends of the members upon the same side are separated widely enough to give a sufficiently-broad base of support, and from this point they converge to the point where the curved upper portions 9 approach each other most closely. Overhanging the latter are two parallel transverse stretchers 10, each of which extends from a point immediately above the extremity of one curved portion 9 to a corresponding point over the extremity of the curved portion transversely opposite. The outer parts of the curved portions are united to the corresponding portions of the stretchers 10 by webs 12, and radiating braces 13 connect the middle parts of the stretchers 10 to the curved parts 9. The lower portions of the structure are connected by horizontal braces 14 and truss-braces 15.

In each of the two structures described the single line of rail may be conveniently formed in two parts, each consisting of an L-shaped piece 16, which comprises half the tread, web, and foot of the rail. These parts are placed back to back, as in Fig. 5, and united by bolts 17. Each half of the foot portion is provided with a downwardly-turned flange 18, and the two-part rail is placed with its foot resting

upon a cross-head or T-shaped support composed of a flat plate 19, arranged horizontally upon two angle-plates 20, the flanges 18 of the rail-foot dropping over the flush edges of the flat plate and angle-plates, to which the rail is united by bolts 21. The vertical parts of the angle-plates 20 lie upon opposite sides of a vertical support formed of two plates 22, which extend downward far enough to provide a space between the cross-head and the lower ends of the vertical plates for the ends of curved parts 9 and stretchers 10. Upon the end of each vertical plate 22 is formed a curved plate 23, curved in an arc struck from the rail-head as a center, its outer edge being provided with a downwardly-turned flange 24. Beneath and against these curved plates 23 is placed a single curved guard-plate 25, provided with flanges 26 upon its edges, which abut against the flanges 24. Bolts 27 unite the structure, and angle-plates 28 are arranged in the angles between the vertical and curved plates 22 and 23 to impart the required rigidity and strength. The structure thus formed is arranged with the vertical plates 22 abutting against flanges 29 upon the ends of the curved parts 9 and stretchers 10, and secured thereto by bolts, one half the curved guard-plate 25 lying beneath the ends of the curved parts 9, as seen in Figs. 3 and 4. It will be understood that the structure shown in Fig. 5 is continuous and co-extensive with the rail which it supports.

The construction of the car is shown in Figs. 1, 2, and 3. It is substantially elliptical in cross-section and constructed of metal or other suitable material. Its ends are either tapered or wedge-shaped to decrease atmospheric resistance, and it is supplied with windows and doors, the latter opening upon the side and fitted within as taste and comfort may require. A strong beam 30 extends from end to end in the central line of the top, and through this beam pass two strong shafts or spindles 31. These shafts extend downward through the floor 32 of the car and through blocks 33 below said floor, springs 34 of suitable power being inserted between the floor and the blocks. The slightly-enlarged upper ends of the shafts 31 extend above the beam 30 and lie in seats in the ends of hangers 35, which are curved laterally or in a vertical plane transverse to the body of the car, in order to pass beneath the outer edge of the curved guard-plate 25 and then be brought over the line of rail. Upon the upper end of each curved hanger 35 is formed or mounted a truck-frame 36, in which are journaled two wheels 37, arranged in the same vertical plane. Each wheel is provided with two flanges lying on opposite sides of the rail. Two of the wheel-journals are prolonged upon one side of the truck, and upon each prolongation is mounted the armature of an electric motor of any suitable type, the mechanism being properly inclosed by a casing or hood 38. I may also employ an independent ar-

mature-shaft, and gear the same with the car-journal in any familiar manner.

Upon the lower end of the hanger, upon each side of the pivotal axis of the shaft 31, is a bracket 39, in which is journaled a safety-wheel or traveling keeper 40, so arranged that its plain periphery lies close to but not in actual contact with the convex surface of the guard-plate 25, its position being such that any material rise of the flanged wheels 37 will bring the safety-wheels into contact with the guard-plate and prevent any further displacement by which the flanged wheels might be permitted to leave the rail on which they travel. This construction and arrangement permit the car to swing laterally under the centrifugal force produced in traversing curves, but always maintain the safety-wheels in the same relation to the guard-plate in all positions assumed by the car. Any excessive swing of the car will be checked by the flanges 26 upon the edges of the guard-plate.

The live conductor for the motor may be arranged in various ways; but I prefer to mount it upon supports 41, arranged in brackets 42, placed upon the cross-head and vertical portion of the structure sustaining the rail, as shown in Fig. 5. The supports 41 are movable vertically in the brackets 42, in which they are supported by springs 43, and the current is taken up by a trolley-wheel 44, rolling on the conductor 45. I may, however, support the conductor upon one side of and below the rail, as in Fig. 3, the trolley being journaled upon an arm 46, which is pivoted upon the hanger 35, and is pressed upon and constantly maintained in contact with the conductor by means of a spring 47.

Upon the upper portions of the hangers 35 is mounted a vertical longitudinal balancing-plate 48, the upper and lower edges of which are extended above and below the points of attachment in order to provide a broad surface against which the wind may act in the event of high gales or blizzards, which might sway the car laterally. As this plate is above the point of support of the car, it is evident that any force of this kind acting upon the car will be counteracted by a like force acting upon the plate.

In order to provide against accident in case the connection between the car and the wheels should give way, I provide the devices shown in Figs. 6 and 7, which consist of a strong bracket 50, securely mounted on the body of the car and reaching over the rail. The end 51 of the bracket which reaches over the rail is shaped in the form of a shoe, with lateral flanges projecting downward. The width of this shoe is made sufficient for its covering the rail under all circumstances. In the illustration the car is supposed to have only one such bracket in the middle, and therefore the shoe is shown of extra width, so that it covers the rail even when passing sharp curves.

The rail 55, as seen in Figs. 8 and 9 of the

drawings, is suspended beneath and forms the lower flange of the supporting-beam, which is suspended from the overhanging ends of the frames. The flange of the rail is shaped as a semicircle, on the upper convex surface of which the wheels run. The wheel-truck 56 carries one or more wheels on each side of the rail. The wheels and their axes are inclined, so as to allow an inclined position of the trucks. 57 is the armature of an electric motor mounted on the axis of a wheel. The live conductor and the trolley may in this case be arranged as shown in Fig. 10. The conductor 58 is mounted on insulators and located underneath the rail in the center of curvature of its flange. The trolley 59 is held upward against the conductor. The safety-anchors 60 are shown in Fig. 11. They are mounted on the car, preferably near the vertical shaft connecting the latter to the truck, and have two prongs which embrace the rail from both sides.

What I claim is—

1. In an elevated railroad, a supporting structure for the rails consisting of columns having straight body-portions and curved upper parts, having supporting structures for the rails secured to their extremities, two of the straight body-portions upon one side of the structure being inclined at an angle to the vertical, to bring the rail over, or nearly over, its base, substantially as described.

2. In an elevated railroad, a rail having its head, web and foot formed in two similar parts, and a guard plate located below the rail and having a curved lower portion, said guard-plate and rail being bolted together, substantially as described.

3. In an elevated railroad, the combination with a car suspended upon doubly flanged wheels running upon a single line of overhead rails, of a guard-plate arranged below said rail and curved in an arc described from the rail-head as a center, and safety-wheels or traveling keepers journaled upon hangers supporting the car with their peripheries in juxtaposition to the guard-plate, substantially as described.

4. In an elevated-railroad, the combination with a car sustained by doubly flanged wheels running upon a single line of overhead rails, of a guard-plate curved in an arc described from the rail-head as a center, and safety-wheels journaled upon brackets or traveling keepers moving with the car, the plain peripheries of said wheels lying in juxtaposition to the guard-plate, substantially as described.

5. In an elevated-railroad, the combination with a car supported by wheels running upon a single line of rails, of shafts passing vertically through the body of the car, and forming vertically pivoted connections between the car and the wheel truck, substantially as described.

6. In an elevated-railroad, the combination with a car supported by wheels running upon a single line of overhead rails, of shafts pass-

ing vertically through the body of the car, their lower ends extending beneath the floor, springs interposed between the floor and blocks connected to the lower ends of the shafts, substantially as described.

7. In an elevated-railroad, the combination with a car hanging from wheels running upon a single line of over-head rails, of a vertical longitudinal balancing plate arranged above the line of rails supporting the car, substantially as described.

8. In an elevated-railroad, the combination with a car hanging from wheels running upon a single line of over-head rails, of a flat, vertical balancing plate arranged longitudinally above the line of rails upon supports moving with the car, a guard-plate curved in an arc described from the rail-head as a center, and safety-wheels journaled upon the supports

carrying the balancing-plate, the peripheries of said wheels being in juxtaposition to the surface of the guard-plate, substantially as described.

9. In an elevated railroad, the combination with a car hanging from wheels running upon a single line of overhead rails, of a vertical longitudinal balancing plate arranged upon supports moving with the car, and a safety bracket or anchor connected to the car and reaching over the rail, substantially as described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

EUGEN LANGEN. [L. S.]

Witnesses:

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L. V. GOEBBELS.